

## DECLARATION FOR THE AMENDMENT TO THE RECORD OF DECISION

### PURPOSE

This decision document presents the amendment to the Record of Decision (ROD) for Operable Unit #1 (OU #1) at the Bofors-Nobel site, in Muskegon, Michigan, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Contingency Plan (NCP).

### BASIS

The decision to amend the ROD is based upon the administrative record. The index attached to the amended ROD identifies the items that comprise the administrative record upon which the selection of the remedial action is based.

### DESCRIPTION OF THE AMENDMENT

The remedy selected in the ROD for OU #1 was a final remedial action for the lagoon area soils and an interim action for site ground water. The remedy consisted of on-site incineration and on-site landfilling for the lagoon area sludges, on-site landfilling of lagoon area soils, construction of an on-site ground-water treatment facility with extraction and on-site treatment of contaminated ground water. The amendment to the ROD eliminates incineration as a treatment technology for the site. All hazardous material will be placed in the on-site landfill that will be constructed as part of the remedial action selected in the ROD.

### STATUTORY DETERMINATIONS

The selected remedy in this amendment is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. However, because treatment of the principal threats of the site was not found to be practicable or cost-effective, this remedy does not satisfy the statutory preference for treatment as a principal element. Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

The State of Michigan concurs on the selected remedy in this amendment.

July 22, 1992  
DATE

Valdas V. Adamkus  
Valdas V. Adamkus  
Regional Administrator

## INTRODUCTION

The Bofors-Nobel (Bofors) site is located 6 miles east of downtown Muskegon on Evanston Road in Egelston Township, Muskegon County, Michigan (see Figure #1). This 85-acre site includes a currently operating specialty chemical production facility, an unused landfill, a currently operating ground-water pumping and treatment system, and 10 abandoned sludge lagoons. The southern portion of the site is bounded by Big Black Creek. There are wetlands within the Big Black Creek floodplain on either side of the creek (see Figure #2).

The Record of Decision (ROD) for Operable Unit #1 (OU #1) was signed on September 17, 1990. It addressed contamination in the lagoon sludges, in the soils under and around the lagoons, and in ground water (see Figure #3). Sludge remediation was addressed through on-site incineration and on-site landfiling. Soil remediation was addressed through on-site landfiling. An interim action for ground-water was addressed through construction of an on-site ground-water treatment facility and upgrading the existing pumping and treatment system. The ground-water remedy was an interim action because no risk based cleanup numbers were available under Michigan Act 307 at the time the ROD was signed. The ground-water extraction well system provides containment of ground water and halts any potential migration of contaminated ground water off site. This document amends the OU #1 ROD and provides for elimination of incineration as a treatment technology for the site. All hazardous material that was originally intended for incineration will be placed untreated in the on-site landfill. This amendment is based on information from the United States Army Corps of Engineers (Corps) pre-design study, 30% design document for incineration and landfiling operations, and the Feasibility Study for OU #1. The information contained in these documents indicates that incineration is impracticable and not cost-effective in dealing with the contamination in the lagoon area soils at this site.

The lead agency for the remedial action at this site is the United States Environmental Protection Agency (U.S. EPA). The State of Michigan Department of Natural Resources (MDNR) is the support agency. This ROD amendment will become part of the Administrative Record File.

Under CERCLA § 117 and Section 300.435(c)(2)(ii) of the NCP, the lead agency is required to propose an amendment to the ROD and allow the public the opportunity to comment on the proposed changes if the differences in the remedial action alter the basic features of the ROD. A public meeting for the original ROD was held on August 1, 1990. The proposed amendment to the ROD was made available to the public on April 6, 1992. The public meeting was held April 16, 1992, at the Egelston Township Hall, Muskegon, Michigan. A response to the comments received during this period

FIGURE #1

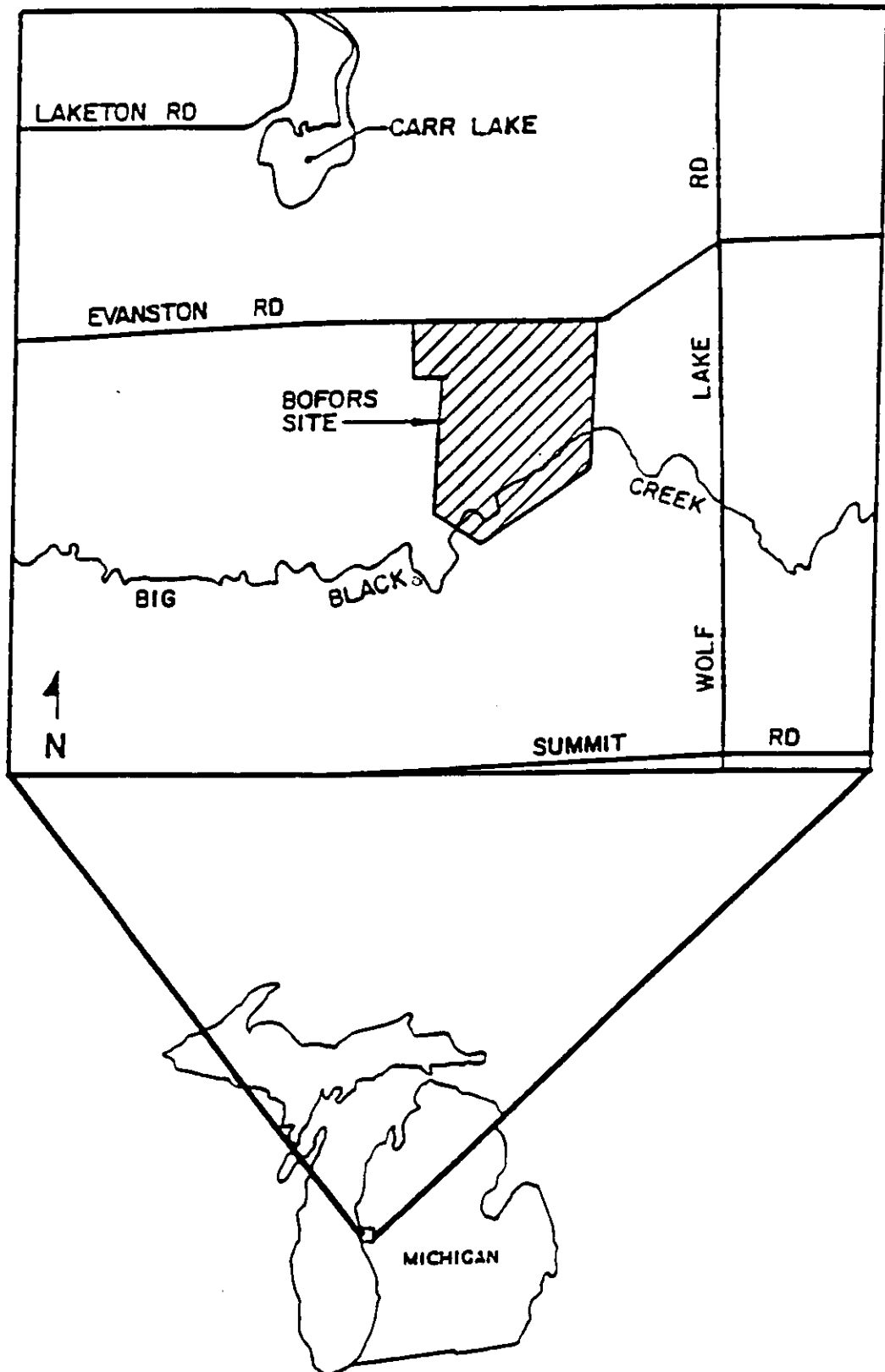
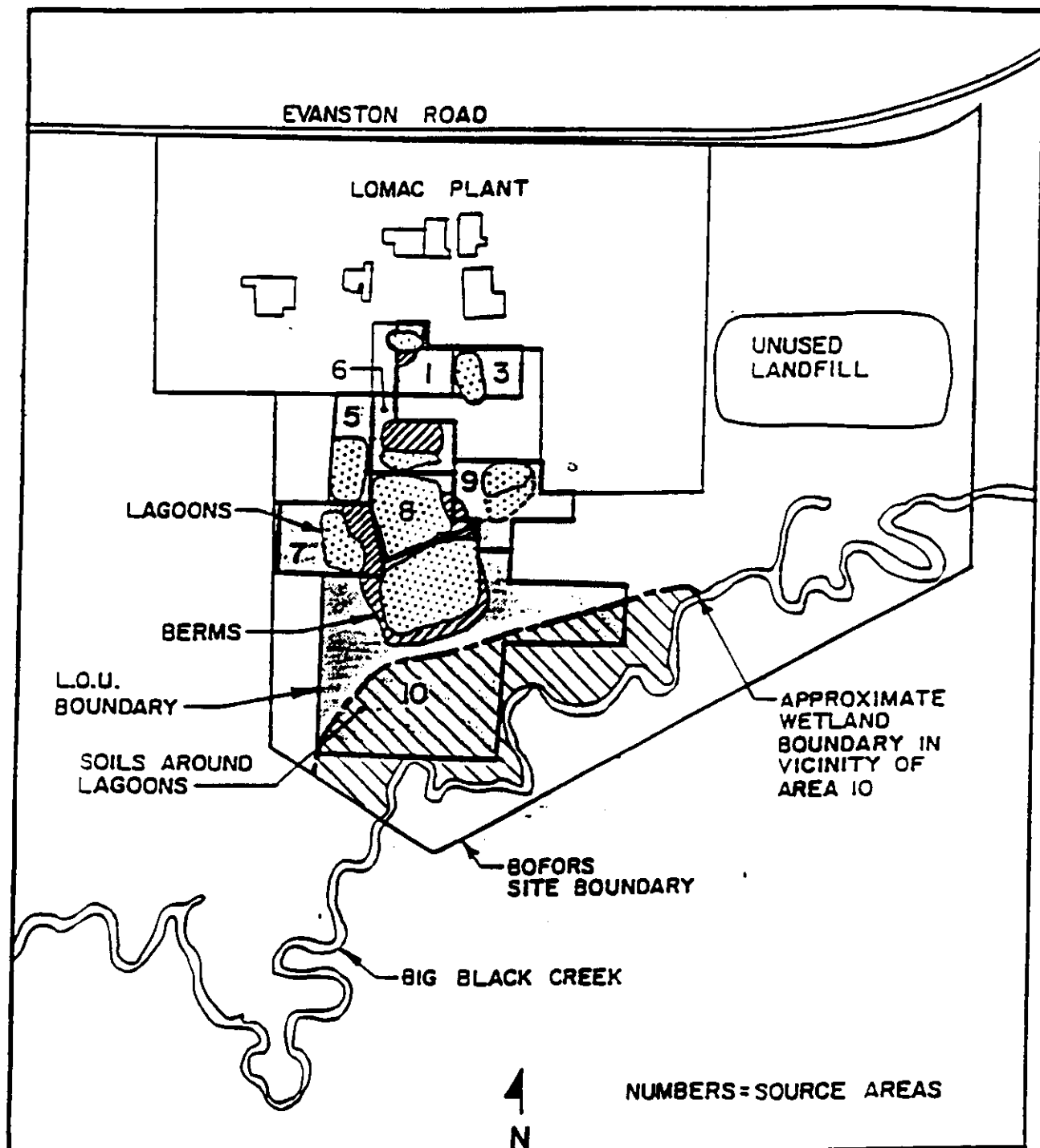


FIGURE #2



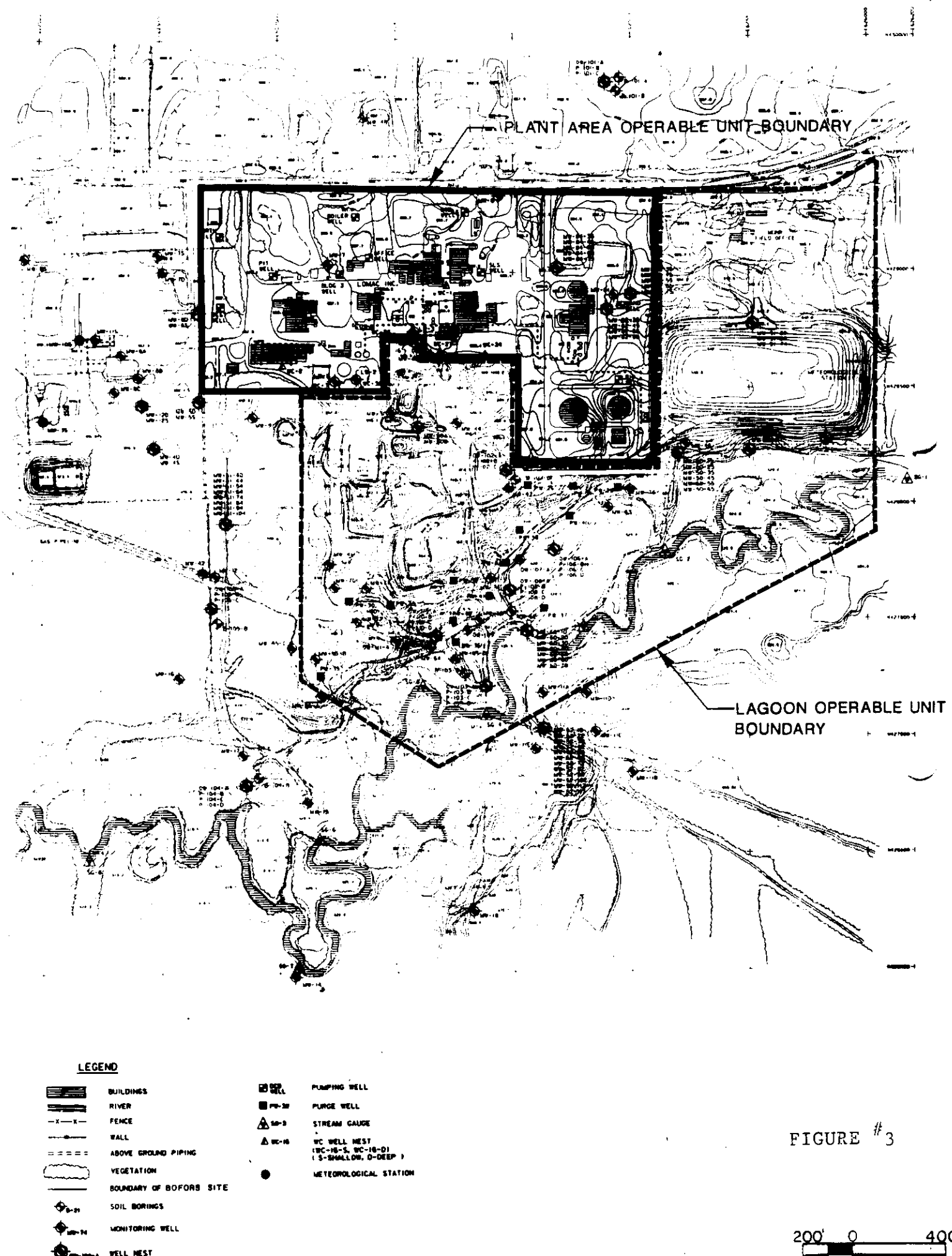


FIGURE #3

is included in the Responsiveness Summary, which is part of this Amendment to the Record of Decision.

The information repositories for this site are located at:

Egelston Township Hall  
5382 East Apple Avenue  
Muskegon, MI 49442

Hackley Library  
316 West Webster Street  
Muskegon, MI 49440

The administrative record, which contains the information upon which remedy selection is based, is available at:

Hackley Library  
316 West Webster Street  
Muskegon, MI 49440

### SITE HISTORY

From 1960 to 1976, the plant produced alcohol-based detergents, saccharin, pesticides, herbicides, and dye intermediates. The lagoons were used for wastewater and sludge disposal until 1976. A ground-water extraction and treatment system was installed in 1976. The site was placed on the National Priorities List in March 1989. The MDNR, with review by U.S. EPA, conducted a Remedial Investigation from the winter of 1987 to the summer of 1989. The ROD for OU #1 for the site was signed on September 17, 1990, which addressed source control in the lagoon area through construction of a ground-water treatment facility, incineration of the lagoon sludges (approximately 108,000 cubic yards), and construction of RCRA-type secure landfill cells to hold non-incinerated material (approximately 426,500 cubic yards) and the ash from the incinerated sludges.

### REASONS FOR ISSUING THE ROD AMENDMENT

Following the signing of the ROD on September 17, 1990, the Corps was tasked by the U.S. EPA to perform the Remedial Design for OU #1 at Bofors. As part of the design effort, a pre-design site investigation was performed to refine the Feasibility Study estimate of the horizontal and vertical extent of contamination at the site and to establish design parameters for the incineration technology. Information gathered during this pre-design investigation has provided critical data which has caused the U.S. EPA to re-evaluate the use of incineration as a treatment technology at the site. Reasons for this re-evaluation include that a much larger volume of contaminated material is present at the site than was originally believed, that there would be inconsistent treatment of contaminated material with the same level of risk, and that the cost and logistics involved in incineration are much greater than originally believed. Further, the large

increase in volume significantly lessens the effective reduction in risk achieved by incineration of those materials the ROD determined should be incinerated.

The soil borings taken as part of the pre-design site investigation established that the volume of contaminated soil that would need to be contained in the on-site landfills is approximately 697,000 cubic yards. The original estimate from the Feasibility Study report was 334,700 cubic yards. This large difference is due to the fact that in the Feasibility Study, an assumption was made that the contamination in soils around most of the lagoons only extended to a depth of five feet. Soil borings taken during the pre-design study indicated that most of the soil around the lagoon area was contaminated down to the water table. In addition, the pre-design investigation found that three hot spots (localized areas of highly contaminated soils) identified in the Feasibility Study for OU #2 are actually contiguous to the contaminated soil in OU #1 (identified as HS1, HS2, and HS3 in Figure #4). OU #2 will address the contaminated soils in the operating plant area and establish the final clean-up objectives for ground water at the site. The division of the site into operable units was based on the need to subdivide the site into more manageable components and to address the greatest threat to human health and the environment first. It was not based on any physical requirements associated with the site. The new information from the pre-design study indicates that the contamination from the hot spots would be better defined as part of the soil contamination from OU #1 and should be treated with that material. The additional volume of soil from the hot spots is approximately 70,000 cubic yards. Consequently, this would bring the total volume of contaminated soils that would need to be placed in the on-site landfills to approximately 767,000 cubic yards.

The evaluation of remedial actions in the Feasibility Study and ROD defined the principal threat wastes as site material containing the highest concentration of the "chemicals of concern". Based on information from the Feasibility Study report, the determination was made that incineration of 108,000 cubic yards of selected sludges and berms would reduce the overall amount of contamination at the site by approximately 64%. The pre-design study conducted by the Corps has found that the Feasibility Study report underestimated the volume of contaminated soils at the site. The Feasibility Study identified 188,000 cubic yards of soil with a risk greater than  $10^{-2}$  (1 in 100 additional risk of cancer). The estimate from the pre-design study was that there are approximately 390,000 cubic yards of soil with a risk greater than  $10^{-2}$ . The pre-design study also found that there were a total of approximately 697,000 cubic yards of contaminated soil that would need to be contained in the on-site landfill cells instead of only 334,700 cubic yards as identified in the Feasibility Study. Based on this information, only 38% of the contaminant mass would be destroyed by incineration instead of 64% as estimated in the ROD. The majority



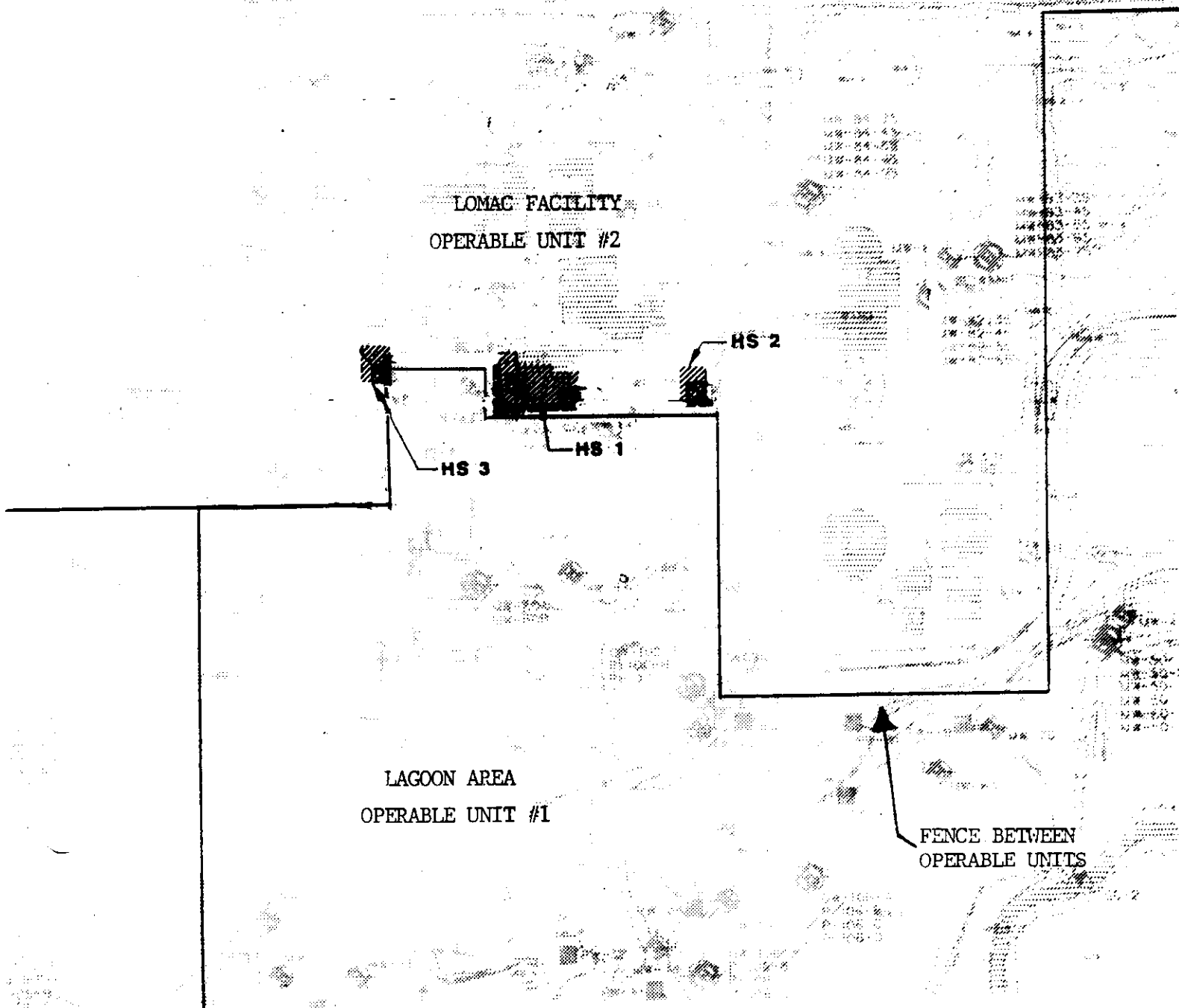


FIGURE #4

HS 1 DCS AND BENZIDINE HOT SPOT (ESTIMATED EXTENT)  
 HS 2 LEAD (Pb) HOT SPOT (ESTIMATED EXTENT)  
 HS 3 DCS HOT SPOT (ESTIMATED EXTENT)


 BORINGS DRILLED DURING 1986 FTCH STUDY

 BORINGS REDRILLED DURING REMEDIAL INVESTIGATIONS

NOTES:

AR IS ACID RECOVERY BORING DRILLED DURING REMEDIAL INVESTIGATION

THE LOCATIONS OF SOIL BORINGS WERE DETERMINED BY VISUAL APPROXIMATION. AND THE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THIS METHOD.

100' 0 200'  
  
 SCALE

of site contamination pursuant to the original ROD, approximately 58%, is in the site soils (as opposed to the sludges) and was to be contained without treatment in the on-site landfills. For this reason, incineration of site sludges is not an effective remediation strategy to reduce the overall amount of contamination at the site.

U.S. EPA policy (November 1991) recommends that risk levels play a major consideration in determination of principal threat wastes. The original ROD defined the principal threat wastes only as site material containing the highest concentration of the "chemicals of concern". An evaluation of site materials identified in the Feasibility Study using levels of risk to identify principal threat wastes revealed that, in addition to the 108,000 cubic yards of contaminated sludges and berms, there are an additional 188,000 cubic yards of contaminated soils with a risk equal to that posed by site sludges and berms. The incineration strategy as outlined in the original ROD did not address this additional 188,000 cubic yards of contaminated soils. Because this volume of soils was to be landfilled without treatment, the incineration of the sludges alone would not significantly add to the reduction of the overall site risk and would not provide any additional benefit to the site. In addition, information from the pre-design study conducted by the Corps indicates that the actual amount of material with a risk equal to site sludges is much larger than predicted in the Feasibility Study report. The current best estimate of material, both soils and sludges, with a risk greater than  $10^{-2}$ , is approximately 497,000 cubic yards. Treatment of this volume of material by incineration is considered impracticable and not cost-effective. This volume of material would require approximately 5 years just to conduct the actual incineration. Additional time would be required to construct the incinerator and to conduct the trial burn. The cost to incinerate 497,000 cubic yards of material is estimated at \$114,000,000. This would bring the estimated total cost to remediate OU #1, including contingencies, to approximately \$221,000,000.

The pre-design study included a sub-scale incineration investigation conducted by the U.S. EPA Incineration Research Facility in Jefferson, Arkansas. The preliminary results indicate that there are several waste related issues that were unknown during the preparation of the Feasibility Study. Some of the sludge from the site has a higher BTU value (energy content) and water content than previously identified. An increase in either BTU or water content can decrease the amount of material that can be incinerated per hour and, therefore, increase the amount of time and the cost to incinerate the sludge. Alternatively, the BTU and water content of these sludges may be reduced by mixing with either other sludges or dirt with lower BTU and water content to produce a single material with more homogeneous values. Pre-mixing of all sludges would produce a feed with homogeneous characteristics but the difficulty of handling, mixing and storage of 108,000 cubic

yards of material prior to the incineration makes this option impracticable. The space available on site is limited and the sequencing required to construct the various landfill cells makes it difficult to identify a suitable area large enough to store this volume of material. The storage space required for 108,000 cubic yards is equivalent to two football fields piled 32.5 feet high. The sludge is thixotropic and becomes more fluid with handling. It would be difficult to pile the material to any significant height without measures to stabilize the mass. An additional concern is the potential air emissions which could be released from the sludge during handling. Mixing would greatly increase the risk of any potential releases.

The wide variance in BTU and water contents cause an additional concern with establishing criteria for the test burn of any incinerator that would operate at the site. Selection of which sludge or mixture of sludges used during the test burn would establish the operation and compliance criteria for the incinerator for the life of the project. Variability in feed material would make it very difficult to optimize facility operations and could mandate several test burns to establish criteria for the various sludge types.

The pre-design study conducted by the Corps evaluated the placement of the landfill cells, on-site incineration facility, and the ground-water treatment facility. The following summarizes the findings of the Corps' pre-design study. The constricted nature of the site would increase the difficulty of sequencing construction of the various facilities, construction of the various landfill cells, and construction of facilities for temporary storage of sludge prior to incineration. Factors that would make implementation of the remedial action very difficult include: 1) the incinerator can not be constructed on site until an initial area has been cleaned and compacted to support its foundation; 2) the incinerator would occupy space that would otherwise be used in landfill cell construction; 3) it would be necessary to construct temporary storage facilities to house sludge prior to incineration (generally a two day supply); and 4) it would be necessary to construct temporary storage facilities to house ash from the incinerator prior to landfilling. Delays in incinerator operation would delay final closure of the landfills since ash from the incinerated sludges would be placed in one of the on-site landfill cells.

When the information gathered during the pre-design study indicated that the use of incineration was no longer an appropriate remedial action for OU #1, the U.S. EPA re-evaluated the spectrum of potential alternatives included in the Feasibility Study. This list of the potentially applicable technologies which could be used to deal with the contaminants at the site is presented in Section 2.4 and Appendix D of the OU #1 Feasibility Study. The list includes 11 methods of containment, 15 methods of incineration,

various disposal options, as well as biological remediation, soil vapor extraction, chemical extraction, soil washing, soil flushing, dehalogenation, low temperature thermal desorption (LTTD), solidification/stabilization, microencapsulation, vitrification, and in-situ vitrification.

Thermal treatment by LTTD was eliminated from further consideration. The results from the treatability study performed as part of the Feasibility Study show that LTTD failed to adequately treat all contaminants of concern at the site and achieve appropriate clean up standards. In addition, the cost of implementing LTTD treatment was shown to be similar to incineration.

Solidification/stabilization technologies were eliminated because a review of treatability data from the Feasibility Study (Appendix E) showed that contaminants of concern would leach through the solidified or stabilized matrix at elevated concentrations. This rendered the technology ineffective as a stand-alone treatment. The use of solidification/stabilization technologies or of a dewatering agent in conjunction with landfilling of the sludges was also considered. The purpose of a dewatering agent would be to remove residual moisture from sludges and help prevent the potential formation of leachate. Discussions with the Corps and experts on this type of technology pointed out that it would be impracticable to treat the organic chemicals of concern at this site by solidification/stabilization and the liner/leachate collection systems of the landfill cells would actually provide the necessary protection of the ground water from the contaminants contained within the landfill cells. Potential technical difficulties were also identified which included clogging of the leachate collection system, a significant increase in the volume of material to be placed in the landfill cells, and an increase in air emissions. Because of the extremely large volume of waste that would need to be contained in the landfill cells, the contingency space would be limited. Any nonessential increase in the amount of material to be contained in the cells would have an adverse impact on landfill construction and could increase operation and maintenance (O&M) costs. The interaction between the dewatering agent and sludge could generate sufficient heat to increase air emissions during the landfilling process. The benefit gained by use of a dewatering agent would not provide any significant reduction in site risks which would not be otherwise provided by landfilling of the untreated sludges. For these reasons, the use of a dewatering agent was not considered appropriate for the site.

Soil washing technology was also dismissed as a treatment prior to landfilling. Treatability studies indicated that this technology was not technically effective or cost-effective in remediating soils at the site to risk-based levels.

None of the technologies considered for treating the sludges and

soils prior to landfilling were able to achieve cleanup goals in treatability studies performed. Further problems were identified in the re-evaluation of various treatment technologies that resulted from the pre-design study. The added costs of these treatment technologies would not provide significant additional risk reduction at the site over landfilling alone.

In summary, the use of on-site incineration was determined inappropriate and not cost-effective. This was due to the lack of significant risk reduction from implementation of this technology, and the significant engineering and logistical problems associated with the construction of the remedy. In addition, none of the other remedial technologies considered were suitable for the site.

#### **DESCRIPTION OF THE NEW ALTERNATIVE**

Estimate of the cost and time required to implement the ROD Amendment alternative of landfilling:

Capital:	\$44,583,522
Annual Operation & Maintenance (O&M):	\$89,030
Present Net Worth:	\$45,498,216
Implementation Time (Total Action):	3 years

This ROD Amendment does not address any issue associated with ground water or deal with the design of the ground-water treatment facility. The capital costs associated with the construction of that facility are currently estimated at approximately \$11,000,000. The cost of ground-water treatment is not reflected in this ROD Amendment. The total estimated capital cost of OU #1, including implementation of this amendment and construction of the ground-water treatment system, will be approximately \$56,000,000.

The ROD for OU #1 called for incineration of approximately 108,000 cubic yards of contaminated sludges and berms with a risk of greater than  $10^{-2}$ . The resultant ash would then be contained in on-site landfill cells. This remedy fails to provide consistent treatment to approximately 400,000 cubic yards of soils with the same risk level. For this reason, incineration does not provide any additional reduction in site risks associated with the contaminated sludges and soils in the lagoon area.

The U.S. EPA has determined that landfilling of the sludges and soils without treatment provide the equivalent level of protection to human health and the environment from site related risks as that provided by the remedy in the original OU #1 ROD. The untreated sludges and soils will be contained in on-site RCRA-type secure landfill cells constructed as part of the original remedial action at the site. Additional information concerning the design requirements for these cells is contained in the original ROD. The landfill cells include two liner and leachate collection systems.

All landfill cells will be upgradient of the ground-water extraction wells which are used to maintain capture of contaminated ground water at the site. All ground water passing under the landfill cells will be captured by this extraction system. Because contaminants will remain in the aquifer after conclusion of the remedial action for this operable unit, the extraction system is scheduled to remain in operation perpetually or until ground-water cleanup criteria are reached. These cleanup criteria will be established as part of the ROD for OU #2. However, regardless of the status of the ground-water treatment system, the landfill and leachate collection system will be continually monitored. If leachate is detected and collected it will be treated in the ground-water treatment system.

Should leachate form despite infiltration protection provided by the cap, it would be trapped by either the primary or secondary liner and leachate collection systems of the landfill cells and then be treated at the on-site ground-water treatment facility. Should the primary liner and leachate collection system (typically consisting of a graded filter layer, a geotextile layer, a drainage layer, an impermeable flexible membrane liner such as 60 millimeter thick high density polyethylene, and 5 feet of compacted clay with a permeability of not greater than  $10^{-7}$  cm/sec) fail, leachate would be trapped by the secondary liner and leachate collection system (typically consisting of a drainage layer, an impermeable flexible membrane liner such as 60 millimeter thick high density polyethylene, and 3 feet of compacted clay with a permeability of not greater than  $10^{-7}$  cm/sec). Should the entire multi-layer liner and collection systems of the RCRA type landfill cell fail, the leachate would be captured by the ground-water extraction system and treated along with contaminated ground water in the ground-water treatment facility.

Since landfilling is a component of the original ROD, capital and O&M costs for the landfill are accounted for in the original cost estimate of the Feasibility Study and is a factor for both the remedy selected in the original ROD and this ROD amendment. The cost estimate proposed for the Remedial Action in the original ROD was approximately \$72,000,000. During early stages of the design, errors in the estimate were identified by the Corps and the working estimate for the design rose to between \$100,000,000 and \$120,000,000. The current cost estimate to incinerate 108,000 cubic yards of contaminated sludge (without evaluating the impact of the engineering design issues identified in the pre-design study such as higher BTU content and higher water content of some of the sludges) is expected to be approximately \$30,313,000. This cost includes mobilization, trial burns, demobilization, process area foundation, and incineration of 116,452 tons of sludge at a cost of \$220/ton. For all construction activities, the Corps estimates that an additional 43% of the remedial action costs should be added to the total cost. This 43% accounts for cost growth, contingencies, oversight and administration. This brings the

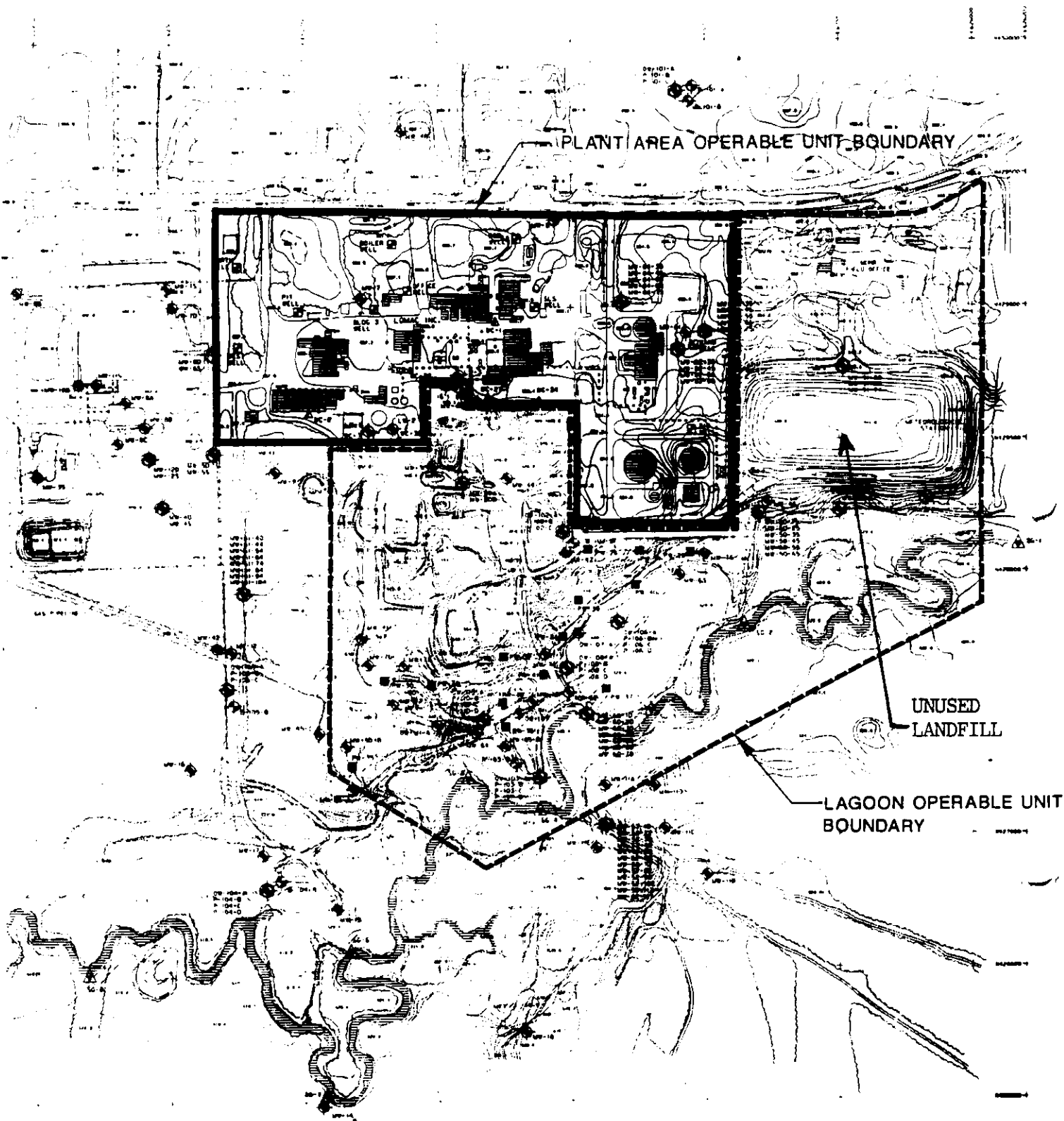
projected cost of incineration and handling of the resultant ash to \$43,476,000.

One of the purposes of the pre-design investigation was to establish what was the actual extent of contaminated soils around the lagoons. These volumes were only estimates in the original ROD. Any additional volumes of contaminated soil identified in the pre-design investigation would need to be contained in the landfill cells which would be constructed on-site. The cost associated with this increased volume of material identified during the pre-design would be the same for either the remedial action or the amendment alternative and is therefore not reflected in the cost of this amendment. This would mean that the total cost savings of instituting this amended remedy would be approximately \$43,476,000. Because of the uncertainties involving incineration of the lagoon sludges identified in the pre-design study, it is very likely that additional costs associated with either incineration or material handling would be identified prior to the conclusion of the design or during the start up of the system.

The three hot spots identified in the Feasibility Study for the proposed OU #2 ROD will be included for disposal along with the soils and sludges of OU #1. The volume of soil from the three hot spots is estimated at approximately 70,000 cubic yards.

The volume of soils and sludges required to be landfilled on-site is approximately double the volume anticipated in the original ROD for OU #1. Because of this large increase in volume, it will not be possible to construct a landfill within the confines of the lagoon area that will be large enough to hold the entire mass. The unused landfill adjacent to the lagoon area but still within the boundary of OU #1 will be expanded and upgraded to meet the requirements of a RCRA type landfill and used to hold the additional material (see Figure #5). Only the lesser contaminated material will be placed in this landfill. In addition, a series of extraction wells will be installed downgradient of this landfill and connected to the ground-water treatment facility. These wells will provide a tertiary containment system should a future problem occur in the leachate collection system for this landfill cell.

The removal of incineration as a treatment technology has led to a re-evaluation of two ARARs for the proposed action of landfilling without treatment of lagoon area soils and sludges. The U.S. EPA now considers that discrete portions of both RCRA and MI Act 64 are relevant and appropriate at the site. Specifically, those substantive portions of RCRA and MI Act 64 which deal with the design and construction of the cover, liner and leachate collection systems for the landfill cells that will be built on-site are relevant and appropriate for the site. No other portions of the regulations are considered appropriate for the Bofors site. Because the design requirements of the MI Act 64 liner and leachate collection systems are more stringent than those of RCRA, the U.S.



# LEGEND

	BUILDINGS		PUMPING WELL
	RIVER		PURGE WELL
	FENCE		STREAM GAUGE
	WALL		WC WELL NEST (WC-16-S, WC-16-D) (S-SHALLOW, D-DEEP)
	ABOVE GROUND PIPING		METEOROLOGICAL STATION
	VEGETATION		
	BOUNDARY OF BOFORS SITE		
	SOIL BORINGS		
	MONITORING WELL		
	WELL NEST		

FIGURE # 5





EPA will defer to the State design requirements as specified in the appropriate sections of MI Act 64.

### **EVALUATION OF ALTERNATIVES**

The following section outlines the nine criteria that were used to evaluate the original selected remedy and the amended remedy. Based on current information, the amended remedy provides the best balance of benefits measured against the nine evaluation criteria. This section profiles the performance of the amended remedy against the nine criteria, noting how it compares to the original ROD remedy.

#### **Overall Protection of Human Health and the Environment**

Both the remedy selected in the original ROD and this amended ROD provide protection of human health and the environment. The incineration strategy as outlined in the original ROD does not deal with site soils posing the same risk as the site sludges nor does it destroy a major portion of site contaminants. The remedy selected in the original ROD relies on containment of these materials to provide overall protection. Both remedies rely on containment and long-term operation and maintenance of both the landfills and the ground-water treatment system to provide overall protection of human health and the environment. For this reason, the reduction of site risks provided by the remedy selected in the original ROD and this amended ROD is expected to be equivalent.

#### **Compliance with ARARs**

Both remedies are expected to comply with all State and Federal ARARs. The substantive portions of both RCRA and MI Act 64 that deal with the design and construction of the cover, the liner, and the leachate collection and monitoring systems for the landfill cells are both relevant and appropriate for the site.

#### **Long-Term Effectiveness and Permanence**

Although incineration of some of the material at the site would provide a permanent remedy for treated materials, the original ROD remedy did not call for the incineration of all OU #1 soils with a risk of greater than  $1 \times 10^{-2}$ , and it addressed only a portion of the heavily contaminated sludges. A significant volume of material with a risk level above  $1 \times 10^{-2}$  was intended to be landfilled in the original ROD. The significantly greater volume of contaminated soils with a risk level greater than  $1 \times 10^{-2}$  found in the pre-design study significantly lessens the effective overall reduction of risk at the site that would have been achieved by incineration of the materials originally selected for treatment in the ROD. In effect, the long-term effectiveness of both the remedy selected in the original ROD and the amended ROD are expected to be equivalent. Long-term effectiveness of both remedies is dependant on maintaining the integrity of the RCRA-type secure landfill cells and the continued operation of the ground-water extraction and

treatment system.

#### **Reduction of Toxicity, Mobility, or Volume through Treatment**

The original ROD called for incineration of site sludges which would reduce the toxicity, mobility and volume of those materials. However, site soils with risks equivalent to site sludges were to be contained in landfill cells under the original remedy, and therefore risks associated with the principal threat wastes would not have been addressed for the overall remedy. This amended ROD does not require treatment of any of the material at the site because treatment is not cost-effective. Consequently this criterion is not satisfied for this ROD Amendment remedy.

#### **Short-Term Effectiveness**

On-site containment is a component of the original ROD and this ROD Amendment. However, the elimination of incineration as a component of this ROD Amendment is expected to reduce overall short-term impacts at the site. Elimination of incineration should also reduce the time required to implement the remedial action at the site. It was estimated in the ROD for OU #1 that it would require 5 years to complete the selected remedy. This estimate included the incineration of the sludges, construction of the landfill cells, filling and closure of the landfill cells, and construction of the ground-water treatment facility. It is estimated that the amended remedy, together with completion of the ground-water treatment facility, will require 3 years.

#### **Implementability**

Implementation of the amended remedy is expected to be easier than the original selected remedy. Issues associated with the substantive regulatory requirements for the incinerator would be eliminated while issues associated with construction sequencing, material handling, and mixing of the sludges should be simplified.

#### **Cost**

The estimated costs for the soil and sludge components of each alternative are in the following chart:

<u>ALTERNATIVE</u>	<u>CAPITAL COST</u>	<u>ANNUAL O&amp;M COST</u>	<u>PRESENT NET WORTH</u>
Original ROD	\$88,059,522	\$89,030	\$88,974,216
ROD Amendment	\$44,583,522	\$89,030	\$45,498,216

The amended remedy is less expensive and provides the same overall reduction of risk at the site. Implementation of the amended remedy is estimated to constitute an overall savings of approximately \$43,476,000 in capital costs.

#### **State Acceptance**

The State of Michigan concurs on the selected remedy in this Amendment to the Record of Decision.

### **Community Acceptance**

There were several comments received from the community during the public comment period. These comments and the U.S. EPA's responses are contained in the attached Responsiveness Summary.

### **STATUTORY DETERMINATIONS**

The amended remedy complies with the requirements of CERCLA § 121 by controlling site risks posed by ground water, air, or direct contact with hazardous site materials through the containment of site soils and sludges. This action will not cause any unacceptable short-term risk or cross-media impacts. The amended remedy complies with all State and Federal ARARs. There are no chemical, action or location-specific ARARs identified for this action that were not identified and discussed in the original ROD. The amended remedy is cost-effective. This Amended Remedy reduces costs associated with construction sequencing, material handling and temporary storage of the sludge as well as eliminating the capital and operational costs of the incinerator. It reduces the overall cost of the remedial action for this operable unit by approximately \$43,476,000 and provides equivalent reduction of site risks as the original ROD.

The amended remedy provides the Best balance of trade-offs with respect to the evaluation criteria. Treatment of the principal threat wastes was found to be not cost-effective and impractical based on the volume of these materials and the limited number of applicable technologies that could potentially treat the contaminants of concern at the site. This action does not satisfy the preference for treatment as a principal element of the remedy.

## **RESPONSIVENESS SUMMARY**

The United States Environmental Protection Agency (U.S. EPA) has recently completed the pre-design study for the remedial design of Operable Unit #1 (OU #1) at the Bofors-Nobel Superfund site in Muskegon, Michigan. As part of the pre-design effort, an investigation was performed to refine the Feasibility Study estimate of the horizontal and vertical extent of contamination at the site and to establish design parameters for the incineration technology. Information gathered during this pre-design investigation has provided critical data which has caused the U.S. EPA to re-evaluate the use of incineration as a treatment technology at the site. An Amendment to the 1990 Record of Decision (ROD) was proposed by U.S. EPA based on the findings of the pre-design study. U.S. EPA held a public comment period from April 6 through June 19, 1992, for interested parties to comment on the U.S. EPA's Proposed ROD Amendment.

The purpose of this Responsiveness Summary is to document the comments received during the public comment period and U.S. EPA's responses to the comments. All of the comments summarized in this document were considered prior to U.S. EPA's final decision.

Following are all the comments received and U.S. EPA's response to each comment.

### **COMMENT:**

EPA should have conducted a more extensive Remedial Investigation/Feasibility Study (RI/FS) and should not have left data gaps to be filled in by studies conducted during the pre-design or remedial design.

### **U.S. EPA's RESPONSE:**

The purpose of the RI/FS process is to gather enough information to make a decision about what will be an appropriate remedial action for the site. During this process, there is an inherent conflict between the time required to gather enough information to reach the decision and the need to respond to an imminent and substantial endangerment to public health or the environment. Some necessary information deals with construction decisions and not with the choice of remedial actions. For this reason, it is appropriate to defer those investigations to the design phase when the focus of the project shifts from choice of remedy to design and implementation of the chosen action.

U.S. EPA recognizes that new information may become available at any time during the remediation process, and that this information could cause U.S. EPA to re-evaluate the selected remedy. For this reason, U.S. EPA has established a process to amend records of

decision. That was the case with this project.

**COMMENT:**

U.S. EPA has no regard for public health during remedial actions. The health of the community should not be at risk due to the type of remediation selected just because U.S. EPA has been mandated to select long-term or permanent or cost-effective remedies.

**U.S. EPA's RESPONSE:**

The primary concern of U.S. EPA is protection of human health and the environment. It is the first criterion by which U.S. EPA evaluates any potential remedy. Throughout the entire Superfund process, from the remedial investigation through the conclusion of the remedial action, U.S. EPA evaluates the impact of site actions on the local communities. However, U.S. EPA is mandated to seek the most appropriate remedy for each site and to seek permanent solutions to site problems. In order to accomplish this, U.S. EPA evaluates each remedy against the nine criteria specified in the National Contingency Plan. Part of this process is to compare the current level of risk posed by the site against the potential of future releases. U.S. EPA evaluates the potential impact from these releases on both local communities and the environment. Only then does U.S. EPA determine the appropriate remedy for the Superfund site. By implementation of this ROD Amendment, U.S. EPA believes that the short-term risks and impacts on the local community will be less than the short-term risks posed by the original ROD remedy.

**COMMENT:**

U.S. EPA should give preference to local contractors when conducting the remedial action and should spend as much money locally as possible during site activities.

**U.S. EPA's RESPONSE:**

U.S. EPA has an agreement with the United States Army Corps of Engineers (Corps) to provide oversight of all remedial design and remedial action activities at the Bofors/Nobel site. As part of this agreement, the Corps will be responsible for advertising and awarding all contracts dealing with site remedial activities. When advertising and awarding contracts, the Corps must follow the Federal Acquisition Regulations (FAR). The FAR provides guidance and places restrictions on how contracting and contracts must be administered. Both the U.S. EPA and the Corps are prohibited from showing preference in either advertising or awarding these contracts. The Corps will advertise the contracts in the Commerce Business Daily which allows any interested contractor throughout

the nation to bid on the project. If the contract is classified as an invitation for bid, the contract will be awarded entirely on cost. If the contract is classified as a request for proposal, the award will be based on the best proposal to implement the Remedial Design. Currently, the contracting mechanism for each of the various phases of the Remedial Action has not been chosen. Regardless of the contracting method used, due consideration will be given to all firms, including small businesses and small, disadvantaged businesses, pursuant to the policies of the FAR.

**COMMENT:**

U.S. EPA should re-evaluate additional alternatives, including SITE program technologies, instead of landfilling material without treatment.

**U.S. EPA's RESPONSE:**

When the information gathered during the pre-design study indicated that the use of incineration was no longer an appropriate remedial action for OU #1, U.S. EPA re-evaluated the spectrum of potential alternatives included in the Feasibility Study. This list of the potentially applicable technologies which could be used to deal with the contaminants at the site is presented in Section 2.4 and Appendix D of the OU #1 Feasibility Study. The list includes 11 methods of containment, 15 methods of incineration, various disposal options, as well as biological, soil vapor extraction, chemical extraction, soil washing, soil flushing, dehalogenation, low temperature thermal desorption (LTTD), solidification/stabilization, microencapsulation, vitrification, and in-situ vitrification. U.S. EPA also evaluated potentially applicable remediation technology currently under evaluation in the SITE program. The SITE program was established to evaluate potentially useful technologies that have not yet been fully developed. These technologies are generally available for pilot scale testing at sites but are not applicable to full scale remediations. As discussed in this ROD Amendment, none of the available technologies was deemed appropriate for the Bofors site.

**COMMENT:**

U.S. EPA should allow local fire officials to review the remedial design for fire safety.

**U.S. EPA's RESPONSE:**

U.S. EPA agrees and will instruct the Army Corps of Engineers to coordinate review of all appropriate sections of the design with local fire and safety officials.

**COMMENT:**

U.S. EPA should provide local firefighting agencies with funds and equipment so that they will be prepared to respond to fire emergencies onsite.

**U.S. EPA's RESPONSE:**

The activities which U.S. EPA contemplates at this site are to be taken in accordance with the National Contingency Plan and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

The fund created in accordance with SARA was established to respond to the release, or potential release, of hazardous substances into the environment. It would be inappropriate for U.S. EPA to use this fund to procure firefighting equipment which would then become the property of local governmental units.

It is the intention of U.S. EPA to cooperate fully with local officials on such matters as the nature of the reagents to be stored on site and potential risks associated with treatment of the contaminated ground waters at the site. Furthermore, as treatment manuals and operator training manuals are developed, U.S. EPA will make them available so that local fire fighting personnel have as complete a picture as possible as to the functioning of the remedial action.

**COMMENT:**

The proposed amendment to the ROD is too stringent and a RCRA-type landfill is over protective. The waste at the site should simply be covered in place and the ground-water treatment system operated to maintain the ground-water plume.

**U.S. EPA's RESPONSE:**

The landfill proposed in the Record of Decision and in the Amendment will provide more long-term protection of human health and the environment than capping alone. The landfill design will incorporate a bottom liner and leachate collection system and thereby further limit infiltration of contamination into the aquifer below the site.

**COMMENT:**

Until an appropriate treatment technology can be developed, it would be more appropriate to place the waste in an above-ground containment building. This building would be 250 foot on a side

and stand 70 foot tall. The cost for this building would be approximately \$6 million and would be cheaper than construction of the landfill.

**U.S. EPA's RESPONSE:**

Above-ground containment was evaluated by U.S. EPA for this Amendment and was not found to provide additional protection to human health and the environment over a RCRA-type landfill system. In addition, the building proposed by the commenter would have insufficient space to hold the volume of material from the Bofors site. Above-ground containment would require 7 such buildings at a cost for construction of approximately \$41 million. The cost of excavation and material handling to place the sludges and soils within the buildings would bring the total cost for such above-ground containment to approximately \$98 million. This significantly exceeds the current cost estimate for the containment portion of this project and does not provide additional reduction of site risks. Additionally, soil at the site will be excavated to the water table and then replaced with clean fill material. It would be difficult to insure adequate compaction of the new fill to provide proper foundational footing for the buildings.

**COMMENT:**

The proposed amendment fails to address restoration of the Lomac property.

**U.S. EPA's RESPONSE:**

Lomac purchased the facility property with the knowledge and understanding that the site would be the subject of a remedial action. The hot spots constitute a small area on the southern edge of the Lomac property and they are adjacent to OU #1. The impact on Lomac operations is anticipated to be minor. The Feasibility Study for OU #2, which deals with the entire Lomac facility property, has been completed and U.S. EPA is currently evaluating potential remedial alternatives. The issue of restoration of the Lomac facility property will be part of the analysis of remedial alternatives for that operable unit. Construction activities of the operable units is expected to overlap. Any required restoration of Lomac property would be most appropriate at the conclusion all remedial actions.

**COMMENT:**

The proposed amendment fails to address issues of confidentiality, security, worker protection and notice to Lomac.



**U.S. EPA's RESPONSE:**

The purpose of the Amendment to the Record of Decision (ROD) is to address changes that have become necessary to the ROD as it was signed in September of 1990. The ROD considered site security and worker protection during implementation of the remedial action. The additional risk posed by inclusion of the hot spots does not add significantly to the previous evaluation of worker risks. Site security is always a significant issue at Superfund sites. Appropriate security measures will be evaluated during the remedial design and implemented as part of the remedial action.

Lomac is a member of the public and will be treated by U.S. EPA appropriately. Every effort will be made to keep all interested members of the community, including Lomac, informed about site activities and any potential impacts to the local area. However, U.S. EPA does not provide any community member special treatment, privilege, or information not available to all other members of the community.

**COMMENT:**

There is no need to excavate "hot spots" on the Lomac property at this time.

**U.S. EPA's RESPONSE:**

Information from the Feasibility Study for OU #2 indicates that the hot spots should be removed to provide increased protection to the environment and potentially reduce the time required for restoration of the aquifer beneath the site. The hot spots identified are actually contiguous to portions of the lagoon area that will be excavated as part of the remedial action for OU #1. It would require significant, unnecessary and duplicative effort and expense to postpone removal of the hot spots until OU #2.

# U.S. EPA ADMINISTRATIVE RECORD INDEX

UPDATE #3

BOFORS-NOBEL SITE

MUSKEGON, MICHIGAN

06/23/92

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